

## 3.5 Polynomials of the Form $x^2 + bx + c$

### Multiplying Binomials and Factoring Trinomials

$$2x(3x+5) = 6x^2 + 10x$$

Diagram illustrating the distributive property (FOIL) for multiplying binomials. The expression  $2x(3x+5)$  is shown. A blue arrow labeled 'M' (Multiply) points from  $2x$  to  $3x$ . A blue arrow labeled 'F' (First) points from  $2x$  to  $5$ . The result is  $6x^2 + 10x$ .

#### How to multiply 2 binomials:

1. Use algebra tiles.

$$(c+5)(c+3)$$

To expand:  $(c+5)(c+3)$

Make a rectangle with dimensions  $c+5$  and  $c+3$ .

Place tiles to represent each dimension, then fill in the rectangle with tiles.

$$= c^2 + 8c + 15$$

Diagram illustrating the use of algebra tiles to represent the product  $(c+5)(c+3)$ . A rectangle is formed with dimensions  $c+5$  and  $c+3$ . The tiles are arranged to represent the product, showing the result  $c^2 + 8c + 15$ .

The tiles that form the product are:  $c^2$ -tile,  $c$ -tiles, and  $1$ -tiles.

So,  $(c+5)(c+3) = ?$

Sketch the multiplication of algebra tiles for each of the following:

$(c + 4)(c + 2)$   $c^2 + 6c + 8$

$(a + 2)(a + 3)$

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2. Use an Area Model to help you:

Expand  $(h + 11)(h + 5)$

L W

	$h$	$11$
$h$	$(h)(h) = h^2$	$(h)(11) = 11h$
$5$	$(5)(h) = 5h$	$(5)(11) = 55$

$$= h^2 + 16h + 55$$

So,  $(h + 11)(h + 5) = ?$   
 $= ?$

?

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$$(a + 20)(a + 3)$$

Area  
Model

	a	20
a	$a^2$	$20a$
3	$3a$	60

$$= a^2 + 23a + 60$$

3. Use FOIL to multiply 2 binomials...

First  
Outside  
Inside  
Last

$$(x + 4)(x - 5)$$

$$x^2 - 5x + 4x - 20$$

$$x^2 - x - 20$$

### Example 1 Multiplying Two Binomials

Expand and simplify

Use FOIL

a)  $(x - 4)(x + 2)$

$$x^2 + 2x - 4x - 8$$

$$x^2 - 2x - 8$$

b)  $(8 - b)(3 - b)$

$$24 - 8b - 3b + b^2$$

$$24 - 11b + b^2$$

$$= b^2 - 11b + 24$$

CHECK YOUR UNDERSTANDING



**SOLUTION**

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## Classwork/Homework

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## Thursday, October 20th

- Check and go over yesterday's homework
- Notes/Examples on factoring Trinomials
- Practice Questions

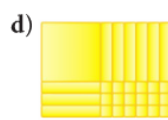
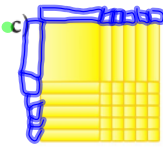
### Classwork/Homework

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4. Write the multiplication sentence that each set of algebra tiles represents.



$$(x+5)(x+5) = x^2 + 10x + 25$$



5. Use algebra tiles to determine each product. Sketch the tiles you used.

a)  $(b+2)(b+5)$

b)  $(n+4)(n+7)$

c)  $(h+8)(h+3)$

d)  $(k+1)(k+6)$



9. Multiply each pair of binomials. Sketch and label a rectangle to illustrate each product.

a)  $(m+5)(m+8)$

b)  $(y+9)(y+3)$

c)  $(w+2)(w+16)$

d)  $(k+13)(k+1)$

$$(m+5)(m+8) = m^2 + 8m + 5m + 40$$

$$(y+9)(y+3) = y^2 + 3y + 9y + 27 = y^2 + 12y + 27$$

12. Expand and simplify. Sketch a rectangle diagram to illustrate each product.

a)  $(g-3)(g+7)$

b)  $(h+2)(h-7)$

c)  $(11-j)(2-j)$

d)  $(k-3)(k+11)$

e)  $(12+h)(7-h)$

f)  $(m-9)(m+9)$

g)  $(n-14)(n-4)$

h)  $(p+6)(p-17)$

$$\rightarrow h^2 - 5h - 14$$

a)

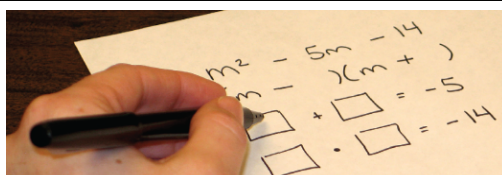
$$= g^2 + 4g - 21$$

h)  $(p + 6)(p - 17)$

$$\xrightarrow{\text{mult}} \frac{a^2 + 7a + 12}{(a+3)(a+4)} \xleftarrow{\text{factoring}} \begin{array}{l} 12 \times 1 \\ 6 \times 2 \\ 3 \times 4 \end{array}$$

Look at the numbers in the trinomial and the binomial.

$$v^2 + 12v + 20 = (v + 2)(v + 10)$$



## Factoring a Trinomial

To determine the factors of a trinomial of the form  $x^2 + bx + c$ , first determine two numbers whose sum is  $b$  and whose product is  $c$ . These numbers are the constant terms in two binomial factors, each of which has  $x$  as its first term.

### Example 2 Factoring Trinomials

Factor each trinomial.

a)  $x^2 - 2x - 8$

You need to find two numbers that multiply to give  $-8$ , but add to give  $-2$ . Create a list to help you....

Factors of $-8$	Sum of Factors
$-1, 8$	$-1 + 8 = 7$
$1, -8$	$1 - 8 = -7$
$-2, 4$	$-2 + 4 = 2$
$2, -4$	$2 - 4 = -2$

$$= (x + 2)(x - 4)$$

CHECK YOUR UNDERSTANDING

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**SOLUTION**



$$\text{b) } z^2 - 12z + 35$$

(The coefficient of  $z^2$  is 1, labeled  $A$  in blue. The constant term is 35, labeled  $m$  in blue.)

The factors are found by listing pairs of numbers that multiply to 35:

- $35 \times 1$
- $(-35) \times (-1)$
- $(-7) \times (-5)$
- $(7) \times 5$

The correct pair is  $(-7) \times (-5)$ , which gives the factors:

$$(z - 7)(z - 5)$$

(The constants  $-7$  and  $-5$  in the factors are underlined in blue.)

Don't forget that you can always check to see if you factored correctly. You can do this by expanding (multiplying) the two binomials.

**Example 3****Factoring a Trinomial Written in Ascending Order**

Factor:  $-24 - 5d + d^2$

$$d^2 - 5d - 24$$



CHECK YOUR UNDERSTANDING

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**SOLUTION**

Classwork/Homework

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